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ABSTRACT

A top-level structure learning strategy is described in this paper. Topics covered in the paper are (1) strategic use of knowledge about top-level structure, including how the strategy works, the spontaneous use of the strategy, and the acquired use of the strategy; (2) fundamental steps in programs of instruction involving the top-level structure strategy; and (3) the results of such programs of instruction, including programs involving elementary school students and special education students. (FL)

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USING TOP-LEVEL STRUCTURE IN TEXT TO PROMOTE READING COMPREHENSION.

Presented at the
26th Annual Conference of the
International Reading Association

New Orleans, U.S.A.
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Purpose of the Paper

In this paper the author considers two outcomes of a learning strategy - better understanding of just what is critical information in a piece of expository text, and better memory of what has been read. The learning strategy and fundamental steps in its teaching are described, and results of studies are reported which generalize findings beyond junior-high students (Bartlett, 1979a) to fifth-graders, and to populations of students receiving special education.

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When one reads with intentions of understanding and remembering information a helpful approach is an application of knowledge about top-level structure (Bartlett, 1979a; Meyer, 1975). Readers aware that a writer's ideas are related together in text, who find a major organizational frame (top-level structure) used by the writer to relate ideas, and who themselves use that same top-level structure to organize encoding and retrieval behaviours, have decided advantages in comprehending and recalling text (Bartlett, 1979a; Meyer, 1975; Bartlett, Note 1).

Specifically, those who use the approach remember more of what they read. Also, they remember more than they had done before using the approach (Bartlett, Note 1). Usually included in this better performance is a retrieval of main idea information (Bartlett, 1979b; Meyer, 1971, 1975). Thus, students who organize retrieval using the same top-level structure as a writer are more likely to demonstrate a recollection of what the writer had considered most important when constructing the text. In this sense, use of knowledge about top-level structure promotes comprehension.

A reader who searches for top-level structure in text may not always find it (Bartlett, 1979b) and runs a risk of impeding memory performance if a level of organization lower in the content structure is selected (Bartlett, 1979a). This risk is reduced if readers knowledgable about structure and confronted by muddled text, deliberately impose a top-level structure on the text rather than select one from lower in the content structure (Bartlett, Turner and Mathams, Note 2).

Strategic Use of Knowledge about Top-Level Structure

Some operational definitions. The term *learning strategy* refers to a planful approach to selecting, processing, storing and retrieving information in a way which will affect a relatively permanent change in behavior. By *top-level structure* is meant an organization used by a writer to frame critical information or main idea content of an intended communication. As such, *top-level structure* differs from *mid-level structure* which is an organizational system for those major ideas used to support the main idea, and from *low-level structure* which serves to relate minor details to superordinate information. All three *levels* combine as the structure of content information in a passage of text.

Meyer (1975) described a *content structure* as a tree-like display of what a passage of text contains. Superordinate ideas are placed at the top-level, least important ideas at the bottom. She saw three differences between content structures and traditional outlines: the content structure diagrams all ideas in a passage; it labels relationships among ideas in a passage; and, it is built by using explicit rules on the semantic grammar of propositions.

How the strategy operates. The strategy of using knowledge about top-level structure centres on recognition of a writer's organizational format and use of that organization to retell what is retrievable. Application of the strategy requires a reader to search for and find top-level structure in reading material prior to a processing of textual content. Further, it requires that the reader deliberately reproduce the structure as a format for organizing information recalled from reading.

The top-level structure so used is a specific model for transmission of information from a writer, through text, to a reader. There are a finite number of top-level structures (Bartlett, 1979a; Meyer, 1975) and four such structures are viewed to be particularly common in expository text (Bartlett, 1979a; Niles, 1965). The four are (a) comparison, (b) cause-effect, (c) problem-solution, and (d) attribute listing (Bartlett and Briese, 1979). Within each are subcategories, for example *comparison* subsumes direct comparison, analogy, provision of alternate viewpoints equally or unequally weighted, and contrast; *attribute listing* includes enumerative order, time-sequencing, and collections in time or space.

Use of a writer's top-level structure sets a frame for readers to relate ideas and propositions retrieved from memory. The frame matches that used by the writer in producing the original text. Such a match for writer and reader permits a closer approximation between what was written and what is recalled, an approximation not only for actual words or ideas, but also for interrelations among them.

As main idea information is patterned by a reader it will cue increasingly subordinate information in a top-down, vertical fashion. If the form to the pattern is the same as that for information in the original text, then relations used to chunk information together during the top-down processing will likely match those of the text. This is particularly the case with content at higher levels of the structure (Meyer, 1971, 1975). The result will be a more literal recall of the writer's ideas and relations. What is remembered will be a more faithful representation of the text because of the organizational procedure both as information is encoded and as it is retrieved.

An example of the organizational process at retrieval is provided by Bartlett (Note 1) in describing typically strategic recall of a text about muscles. The text, arranged in comparison top-level structure, contains information about voluntary muscles, involuntary muscles, and muscles with both properties. The main idea is that the three types are compared and contrasted. As the top-down process begins, more specific information about each type of muscle is cued, for example - examples and functions, more detailed explanation of the terms "voluntary", "involuntary", and, and so on.

With three of the four common structures, an additional aid to memory is provided. All but *attribute-listing top-level structure* have two (or more) nodes within the top-level (See Figure 1). As vertical cueing process downwards from each node, a cueing *across* levels is also possible. For example, naming *examples of voluntary muscles* may prompt the reader to attempt to remember *examples of involuntary muscles*, and *of muscles with both properties*.

INSERT FIGURE 1 ABOUT HERE

A combination of vertical and cross-wise triggering of memory would make comparison, cause-effect, and problem-solution formats particularly powerful aids in memory performance. Some support for this speculation was provided when Meyer and Freedle (in press) found differences in memory performance related to type of structural format used to organize content. Notably, comparison and cause-effect top-level structures were more helpful than problem-solution and attribute listing formats.

Regardless of type, top-level structure frames main idea information. Those who apply the strategy successfully will retrieve ideas most important in a given text. Essentially, successful application can occur spontaneously, or may be induced through specific programs of instruction.

Spontaneous use of the learning strategy. Strategic use of knowledge about structure will occur spontaneously for many readers as experience in reading lengthens (Bartlett, Note 1). However, such onset appears to pass through a lengthy stage of inefficient production.

During the stage of inefficient production, a reader's strategic behavior will be inconsistent and relatively ineffective (Bartlett, Turner and Mathams, Note 2). Readers able to use the strategy will not always produce it when it is appropriate to do so, and, on occasions of its production may be unaware of, or unable to verbalize, their strategic behavior (Bartlett et al., Note 2).

The stage of inefficient production appears to dominate applications of the learning strategy by readers from fifth to eleventh grades (See Note 1). During this stage, large numbers of readers will perform with wide individual variability on classroom tasks which require a literal comprehension of reading material. On occasions when the strategy is produced intentionally, performance will be better than for occasions when an indeliberate use or no use is made of a writer's top-level structure (Bartlett, 1979a; Bartlett et al., Note 2). Such variability must provide teachers with confusing information about students' reading abilities and scholastic aptitudes and may explain lack of association found (Bartlett et al., Note 2) between teacher ratings of students' reading ability and student performances in remembering text.

Assuming any organizational strategy will be produced more consistently and effectively over time (Flavell, 1977), natural development of an efficient and strategic behavior may require an earlier stage of inefficient production.

The alternative to natural development is a production induced through training.

Acquired use of the learning strategy. Through a series of intervention studies (Bartlett, 1979a; Bartlett and Briese, 1979; Bartlett et al., Note 2; Bartlett and Usher, Note 3; Bartlett and Power, Note 4) it has been observed that students have learned to utilize knowledge about top-level structure where previously they had not used this form of organization. Others who had been inconsistent or ineffective in using the knowledge strategically, became more systematic. Even in cases of an informed, natural use of the strategy prior to a training intervention, specific instruction seems to have facilitated a clearer understanding of the strategic process (Bartlett, 1979a, 1979b). Consequently, instructed readers generally have made significant gains from pre-training levels of performance in retrieving most important information and in general free recall.

Induced application of the strategy appears to have advantages over natural development, at least with readers in stages of non-production and inefficient production. Advantages are concerned with an earlier acquisition of three outcomes associated with specific and intensive instruction. Students provided with special training are more likely than untrained students to produce the strategy when it is appropriate to do so. They are more likely to be systematic in applying the strategy. And, they are more likely to attain better understanding and recall of what they read.

Fundamental Steps in Programs of Instruction

Programs with which the author is familiar have been written for fifth-graders (Bartlett, Turner and Mathams, Note 2), eighth-graders (Bartlett and Usher, Note 3), ninth-graders (Bartlett, 1979a), eleventh-graders (Bartlett and Usher, Note 3), mildly-intellectually handicapped adolescents (Bartlett and Briese, 1979), deaf pre-adolescents (Bartlett and Power, Note 4) and single-case, 10-year olds in remedial settings (Bartlett, Note 7). Empirical evaluation of the last two of these is in progress and cannot be reported at this time.

These programs are student-centred. Students are required to be actively involved in discovery of the strategy, in labelling each of the four top-level structures covered in the programs, in applying the strategy, and in deciding on the usefulness of their discovery. Teachers guide the discovery, and provide corrective feedback for student activities. All programs contain lesson plans outlining objectives, content, method, and assessment for each lesson. Lesson plans are contained in Teacher Manuals.

Workbooks are provided for students. These contain graded and sequenced information, exercises, and activities, self-correcting feedback sheets, and progressive assessment reports which are completed by class teachers. Passages selected for demonstration, practice, or testing purposes generally were extracted from classroom text across content areas for a given grade. Some were modified or constructed to accentuate particular components of a program.

In a program for mildly-intellectually handicapped adolescents (Bartlett and Briese, 1979), introduction of each of the four top-level structures is spaced across the six-week program. Revision and discrimination lessons were included in a delivery format as shown in Figure 2. Much greater emphasis is placed on oral discussion and teacher involvement in this program than in those for junior-high (Bartlett, 1979a) and high school students (Bartlett and Usher, Note 3).

INSERT FIGURE 2 ABOUT HERE

With younger children (Bartlett et al, Note 2), and with deaf pre-adolescents (Bartlett and Power, Note 4), programs have included extensive pictorial content. Pictures are used to accent organization as teachers guide discussion about each of the four top-level structures. In both programs, workbooks are included to shape students' use of top-level structure in generating their own oral and written productions. As with instruction at junior-high and high school levels, these programs have all four top-level structures introduced together in an early session. Following sessions are used to develop greater understanding of, and discrimination between, the structures. Typically, the programs are sequenced as shown in Figure 3.

INSERT FIGURE 3 ABOUT HERE

All programs have similar fundamental steps. These are:

1. To focus or induce a student's awareness of structure
2. To provide a specific knowledge of four types of top-level structure
3. To foster an expectation of finding top-level structure in a passage of text

4. To provide behaviors appropriate to confirming presence or absence of a clearly-defined, top-level structure.
5. To develop skill in utilizing for retrieval purposes, a detected top-level structure, or, an imposed, top-level structure where text has no clearly-defined structure.

Results of Programs of Instruction

A comparison of training effects across programs outlined in this paper is shown in Table 1. In each of five studies where extensive instruction was provided, students acquired skill in implementing knowledge of top-level structure. Learning outcomes of the acquisition were improved comprehension and memory performances with text.

INSERT TABLE 1 ABOUT HERE

The bad get good. In each study, a large corpus of students has been shown to have not even an indeliberate usage of top-level structure in text. In response to a probe of awareness about planning used by a writer to organize a stimulus text, these students responded in ways which indicated either no knowledge of text organization or an inability to verbalize such knowledge. In addition to an inadequate or inappropriate response to the probe, those in this corpus had organized written recall in a format quite different from that of the text. This sub-group represents a *floor-level* from which advances might be made in both knowledge about the structure and strategic application of the knowledge.

With ninth-graders (Bartlett, 1979a), 60% of those who received instruction had entry behavior at the *floor-level* described. Following instruction, incidence was reduced to 11.3%. For fifth-graders (Bartlett, Turner and Mathams, Note 2), corresponding figures were 72% and 4%. With

M.I.H. adolescents (Bartlett and Briese, 1979), all students were at the *floor-level* prior to instruction. After the intervention, 30% remained at that level.

The not so bad get better. A second subgroup found in each study is constituted by readers who do use a writer's organizational structure to retrieve information, but who do not respond appropriately to probes of awareness of organizational structure. This level is an advance from that described in the previous paragraph. Readers have a practical and advantageous use of the strategy but are not yet sufficiently aware of text-structure or of their own organizational behaviors to enable a successful response to the probe. These students are still in meta-cognitive transit towards production-efficiency.

Studies (Bartlett, 1979a; Bartlett and Briese, 1979) with younger children have shown major shifts in strategic behavior following instruction, from the *floor-level* to a level of *unaware* usage. For example, prior to instruction, 8% of fifth-graders used, but could not identify correctly, the top-level structure of a stimulus text. Following instruction, incidence increased to 24% of those taught. While still not at the optimal level of an aware and appropriate use of knowledge about top-level structure, these students at least were using an organization which aided comprehension and memory performances.

Three weeks later, 52% of the treatment group was at the level of *unaware* usage. The larger number resulted in major part from a regression in level of strategic behavior by many students who had used and identified top-level structure from a stimulus text on the earlier posttest. For all students who performed in this relatively *unaware* way, instruction, and or, induction had been inadequate.

Bartlett and Briese (1979) found M.I.H. adolescents of 13 - 15 years generally responsive to training in that 12% shifted from a floor-level to a level of *unaware* usage. These students used a correct top-level structure to organize memory performance, but incorrectly labelled the structure. An additional 62% changed from a floor-level performance on pretest to using a different but feasible structure on posttest. For both sub-groups, the posttest levels of strategic behavior were below the ideal of a deliberate and correct use. However, both mark improvement levels which manifested in better memory and comprehension performances.

In contrast, ninth-graders tend to move directly into consistent and effective strategic behavior. Bartlett (1979a) found 32% at a level of *unaware* use prior to instruction. This incidence dwindled to 13% immediately following the intervention and remained at that level on test performance three weeks later. Bartlett and Usher (Note 3) obtained similar figures with eighth-, and eleventh-graders.

And the good get gooder! Particularly with older students, and with the exception of M.I.H. adolescents (Bartlett, Note 1), some readers across the studies have demonstrated an optimal strategic behavior without instruction. However, as noted earlier in the paper such demonstration is not likely to be a consistent one. For example, Bartlett (1979a) found that only one of 49 untrained ninth-graders used the strategy at this level across three tests. Bartlett, Turner and Mathams (Note 2) observed that none of the 29 fifth-graders who served as non-instructed controls used the strategy at its optimal level on each of three test performances.

Instruction for those who can be optimally strategic in applying knowledge of top-level structure, seems to increase what readers know

and how they apply the knowledge. For example, Bartlett (1979a) suggested about instructional effects:

> It seems that subjects who had previously demonstrated high levels of the target strategy responded not merely to discussion of the nature of top-level structure, but rather to instruction of how to use its properties to better organize free recall. Posttreatment recall scores were improved as a result. Students with similar previous attainment who did not receive instruction on the strategic technology of top-level structure (a) were less likely to reproduce a high level of the strategy, and (b) did not improve recall in cases where the high level was reproduced. (p. 124)

Conclusion

Top-level structure is a text characteristic different from, but related to, actual text content. It relates to content in that structure is essential in a carriage of a writer's ideas to a reading audience. Top-level structure will carry the writer's main idea, the gist of informational content.

Comprehension as measured by a literal recall of a writer's information, will be promoted as a reader becomes more knowledgable about top-level structure and more able to utilize that knowledge in systematically selecting and processing information. From this basis more creative levels of comprehension may be constructed. Thus for inference-drawing, and generalization of understanding beyond an immediate context, an ability to retell a writer's most important information is critical.

This ability will develop naturally for many readers. But natural development will take time and practice both of which are limited and valuable commodities during the reader's school years. A more effective use of the commodities may be in an instructional induction of a useful knowledge of top-level structure in text. With

young readers, older students and those with special needs in education, an induced application of the strategy had demonstrable effects in promoting better comprehension and memory.

FOOTNOTE

There is no record of consistency in spontaneous production of the organizational strategy with older subjects though data which might be analyzed in this way may be available from research with college graduates (Meyer, 1975; Meyer, Brandt, and Bluth, Note 5) and with adults of various ages (Meyer, Rice, Knight and Jessen, Note 6).

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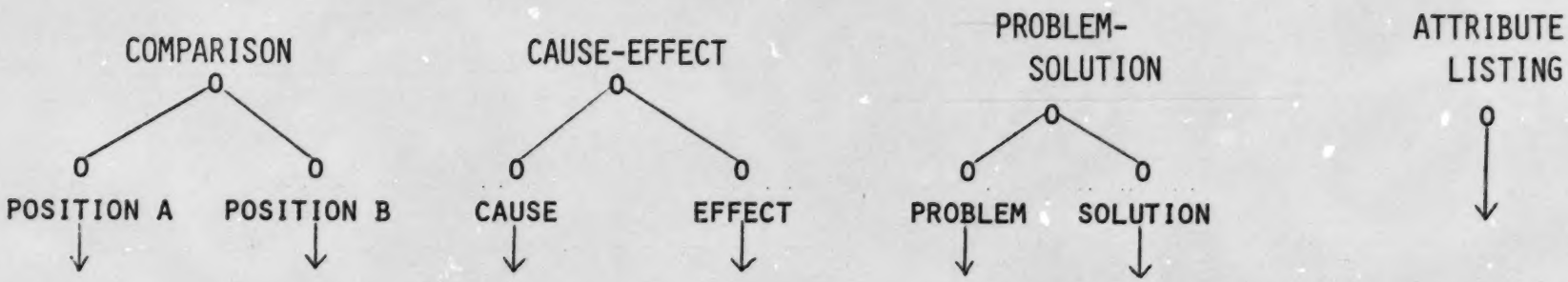

Figure 1. -- A schematic representation of four types of top-level structural organization.

TABLE 1

Comparison of Training Effects for Various Programs of Instruction in Strategic Application of Knowledge about Top-Level Structure

Researcher	Grade level of subjects	Approximate age	Shift in level of strategic behavior	Improvement in memory performance	Improvement in apprehension of main idea information	Maintenance effects
Bartlett, Turner & Mathams (Note 2)	5	8 - 10 years	Significant. Mainly from *floor-level* to *optimal level.*	Significant. *From* Mean 10.6, s.d. 6.6 *to* Mean 21.9, s.d. 6.6	Significant. *From* 32% *to* 88%.	Some regression towards an intermediate level of strategic behavior. Slight decrement in memory performance.
Bartlett & Usher (Note 3)	8	11 - 13 years	Significant. Mainly from *floor-level* to *optimal level.*	Data not yet fully analysed		
Bartlett (1979a)	9	12 - 14 years	Significant. Mainly from *floor-level* to *optimal level.*	Significant. *From* Mean 24.4, s.d. 13.9 *to* Mean 57.8, s.d. 29.	Significant	Little regression or decrement in memory performance.
Bartlett & Usher (Note 3)	11	14 - 16 years	Significant. From both *floor-level* and *intermediate level* to *optimal level.*	Data not yet fully analysed.		
Bartlett & Briese (1979)	adolescent M.I.H.	13 - 16 years	Significant. All from *floor-level* to an *intermediate level.* None at *optimal level.*	Significant. Mean improvement 7.56, s.d. 5.82.	Significant. *From* 0% *to* 31%.	Little regression or decrement in memory performance.
Bartlett & Power (Note 4)	deaf pre-adolescent	11 - 12 years	Significant. Mainly from *floor-level* to *optimal level.*	Data incomplete at this stage.		
Bartlett (Note 7)	single-case remedial	8, 10 years	Significant Both from *floor-level* to *optimal level.*	Significant	Significant	No regression or decrement in memory performance.

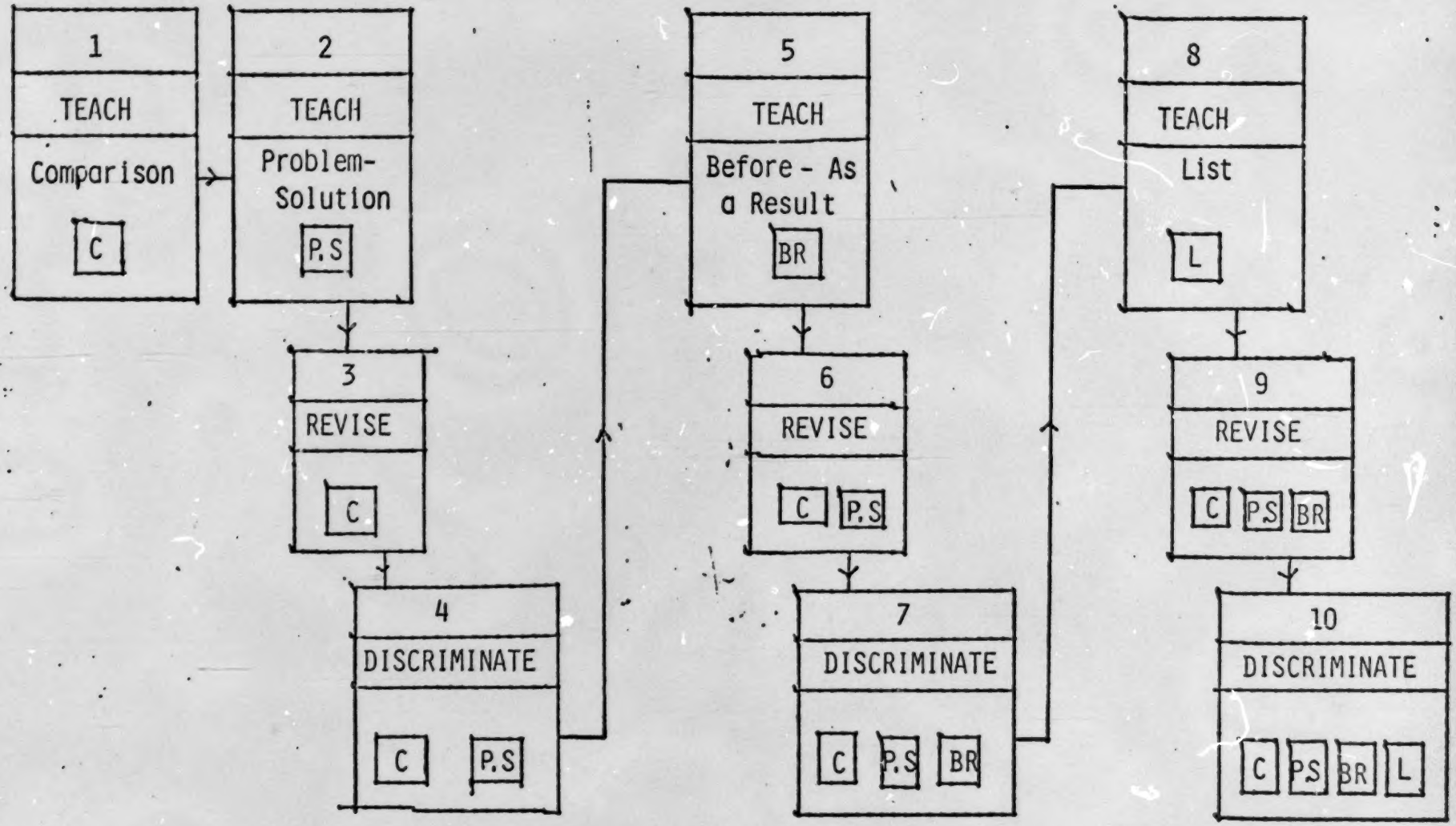

Figure 2 Showing ten instructional steps for teaching four basic top-level structures in classroom text.

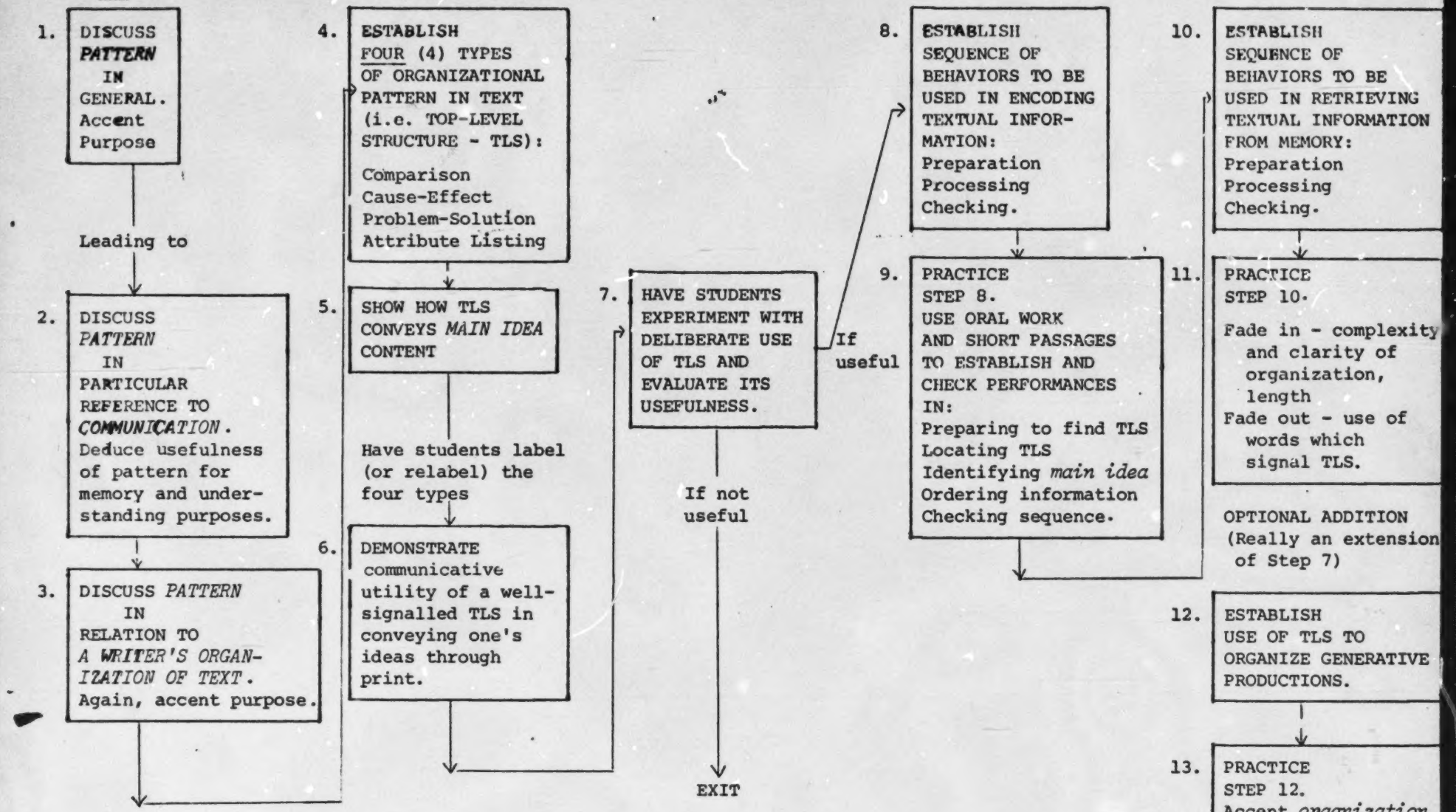
1. DISCUSS PATTERN IN GENERAL. Accent Purpose
Leading to
2. DISCUSS PATTERN IN PARTICULAR REFERENCE TO COMMUNICATION. Deduce usefulness of pattern for memory and understanding purposes.
3. DISCUSS PATTERN IN RELATION TO A WRITER'S ORGANIZATION OF TEXT. Again, accent purpose.
4. ESTABLISH FOUR (4) TYPES OF ORGANIZATIONAL PATTERN IN TEXT (i.e. TOP-LEVEL STRUCTURE - TLS):
Comparison
Cause-Effect
Problem-Solution
Attribute Listing
5. SHOW HOW TLS CONVEYS MAIN IDEA CONTENT
Have students label (or relabel) the four types
6. DEMONSTRATE communicative utility of a well-signalled TLS in conveying one's ideas through print.
7. HAVE STUDENTS EXPERIMENT WITH DELIBERATE USE OF TLS AND EVALUATE ITS USEFULNESS.
If useful
If not useful
EXIT
8. ESTABLISH SEQUENCE OF BEHAVIORS TO BE USED IN ENCODING TEXTUAL INFORMATION:
Preparation
Processing
Checking.
9. PRACTICE STEP 8.
USE ORAL WORK AND SHORT PASSAGES TO ESTABLISH AND CHECK PERFORMANCES IN:
Preparing to find TLS
Locating TLS
Identifying main idea
Ordering information
Checking sequence.
10. ESTABLISH SEQUENCE OF BEHAVIORS TO BE USED IN RETRIEVING TEXTUAL INFORMATION FROM MEMORY:
Preparation
Processing
Checking.
11. PRACTICE STEP 10.
Fade in - complexity and clarity of organization, length
Fade out - use of words which signal TLS.
OPTIONAL ADDITION (Really an extension of Step 7)
12. ESTABLISH USE OF TLS TO ORGANIZE GENERATIVE PRODUCTIONS.
13. PRACTICE STEP 12.
Accent organization rather than content.

Figure 3 -- A schematic of steps used in several programs to establish a strategic application of knowledge about top-level structure in text.